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## **A SOCIAL SCIENCES**

AA	PHILOSOPHY AND RELIGION
AB	HISTORY
AC	ARCHAEOLOGY, ANTHROPOLOGY, ETHNOLOGY
AD	POLITICAL SCIENCES
AE	MANAGEMENT, ADMINISTRATION AND CLERICAL WORK
AF	DOCUMENTATION, LIBRARIANSHIP, WORK WITH INFORMATION
AG	LEGAL SCIENCES
AH	ECONOMICS
AI	LINGUISTICS
AJ	LITERATURE, MASS MEDIA, AUDIO-VISUAL ACTIVITIES
AK	SPORT AND LEISURE TIME ACTIVITIES
AL	ART, ARCHITECTURE, CULTURAL HERITAGE
AM	PEDAGOGY AND EDUCATION
AN	PSYCHOLOGY
AO	SOCIOLOGY, DEMOGRAPHY
AP	MUNICIPAL, REGIONAL AND TRANSPORTATION PLANNING
AQ	SAFETY AND HEALTH PROTECTION, SAFETY IN OPERATING MACHINERY

## DEVELOPMENT OF CONSTRUCTION PROJECTS AS A COMPOUND AGGREGATED SYSTEM

<sup>a</sup>VADYM POKOLENKO, <sup>b</sup>OLENA BONDAR, <sup>c</sup>OLEKSIY YASCHENKO, <sup>d</sup>IRINA YAKYMCHUK, <sup>e</sup>NATALIIA LATANIUK

<sup>a-e</sup>Kyiv National University of Construction and Architecture, 31, Povitroflotsky Ave., 03037, Kyiv, Ukraine  
 e-mail: <sup>a</sup>pokolenkoio@ukr.net, <sup>b</sup>alenka\_boni@i.ua, <sup>c</sup>yaschenko\_afi@ukr.net, <sup>d</sup>madamirai52@ukr.net, <sup>e</sup>natalilataniuk@ukr.net

**Abstract:** The article considers development as a modern form of investment activity in the real estate market. Features of development projects are outlined, and problematic issues of designing and implementation of development projects are identified from the point of view of an aggregated system approach, which is using the latest information technologies. Development is also considered within the framework of the urban development ecosystem, which is also a component of the principle of an aggregated system. The practical significance of the study lies in the fact that the main theoretical and methodological provisions can be used both for further theoretical research and in the practical activities of economic entities of the construction complex in order to improve project management and increase the efficiency of construction organizations and urban planning as whole.

**Keywords:** development; real estate; gentrification; Big Data; ecosystem; urban planning.

### 1 Introduction

The effective development of the investment and construction complex requires the use of new technologies, the introduction of progressive forms of production organization, the use of modern materials and products, which is impossible without relying on modern management theory, an integral part of which is the theory of project management. This is due to the fact that finding the optimal way to implement a project on time with the most efficient use of resources is a key success factor, and with ever-increasing competition, it is a guarantee of the construction organization's survival. The project approach to management has already proven its effectiveness in practice and is used by the world's leading companies.

At the present stage, the investment aspects of construction activities have been considered for a number of years as the most important component of a systemic vision of the processes that lead to the creation of finished construction products [1]. Starting from the analysis of theoretical aspects, it is also necessary to note the importance of optimizing investment and construction activities, which can be carried out through development tools - managing the creation, qualitative transformation, operation, and market value of real estate objects [10]. The concept of "development" is the initiation, development and promotion of projects related to the creation of new real estate objects and the reconstruction of existing ones for the purpose of making a profit [20]. The creation of each real estate object is a special investment project, so the basis for studying the development process is the approach to it namely as to investment project, that is, in fact, a systematic approach. The concept of "development project" is a system of goals formulated within its framework, strategically aimed at fulfilling the overall mission, technological processes, technical and organizational documentation, material, financial, labor, intellectual and other resources, as well as management decisions and measures for their implementation [4, 11].

Development is a special process and a special type of professional activity (business) associated with the qualitative transformation of real estate and ensuring an increase in its value [33]. Thus, the key features of development are precisely the qualitative, that is, the fundamental transformation and increase in the value of real estate, including the effectiveness of investments.

On the other hand, development also acts as a system for managing the process of creating and developing real estate, resulting in a change in its physical, economic, legal properties [16]. Thus, the physical processes of development ensure the emergence of new consumer qualities in a real estate object that

correspond to the changing needs of society. These changes can be both cardinal (for example, transformation of an undeveloped plot of land into a cottage village) and not very noticeable externally (for example, change in the intended use of a land plot). But these changes always present and are a necessary sign of development, a necessary condition for increasing the economic effect of using a property.

The economic processes of development are implemented in the form of an increase in the value of the property due to the physical changes made. At the same time, the increase in value is ensured not by any physical transformations, but only by those that meet the requirements of the market and the needs of its consumers. The greater this correspondence, the higher the value of the object being created, the higher the efficiency of development.

Projects related to the development of real estate have their own specifics and distinctive features: high capital intensity and labor intensity of projects, duration of the investment cycle, the unity of the object being created, etc. The main goal of a development project is to generate income from the increase in real estate value. This can be achieved only in the case of combining land, capital, and labor in the process of project implementation, as well as ensuring their interaction, which will give a new quality that allows the object to be realized at a cost higher than necessary to recover costs [4]. Thus, development in the investment and construction complex is a way of organizing investment and construction activities in the entire range of existing modifications and depending on the breadth of coverage of a real estate object' life cycle.

At the same time, many problems of modern development in the systemic plane remain little studied to date. Moreover, tendencies of influence from digital technologies and digital transformation, gentrification, etc. are contradictory, which requires especially thorough research.

### 2 Materials and Methods

The general approach to research issues is based on an integrated method, which, in turn, combines a series of more differentiated methods and systemic views. First, the study is carried out within the framework of the contextualist paradigm and proceeds from the key premise that settlement systems, the organization of urban spaces and diverse suburban areas are the physical embodiment of wider invisible processes (political, economic, production-technological, cultural) and that there are a kind of "rules for translating" these processes and concepts into some concrete material form. Secondly, the components of the structural method are used in the work - in the process of considering the development functions and their information technology support. Elements of the case study method were also applied.

### 3 Results and Discussion

Acting as the most important area of real investment, the implementation of development projects is not only a way to increase the wealth of the owner or a source of income for the developer and investors, but also has a real impact on economic processes, budget revenues, and social relations in society. The conditionally positive impact of development on the economy can be boiled down to two aspects: territorial and sectoral.

The territorial aspect of the influence of development implies that the development of real estate leads to a qualitative change not only in the real estate objects themselves, but also in their environment. If at the same time the option of real estate development turns out to be the best possible, then the positive impact of development on the improvement of the surrounding territories is maximum and contributes to the maximum increase in their value [2, 3]. The sectoral (macroeconomic) aspect of the positive impact of construction development on economic

development is determined by the high multiplier effect of business activity in the real estate sector.

When determining the functions of a developer, it seems legitimate to implement the approach that correlates them with five main stages in the implementation of real estate development projects [21]: 1) Development of the concept and preliminary review of the project; 2) Location assessment and project feasibility study; 3) Design and evaluation of the project; 4) Contracting and construction; 5) Marketing, management, and disposal of results.

At the same time, at each stage of the implementation of real estate projects, the developer acts as a key figure, initiating the development process, making economically sound, most effective decisions at each stage of the project, taking into account the needs of the market and the interests of all development participants [5-9]. The significance of the developer for the implementation of the real estate development process is determined by the fact that, while ensuring coordination between all participants in the development, he is responsible to direct investors for the effective management of their funds, to banks - for the return of credit resources, to government agencies that authorize the implementation of the project - for its quality, to contractors for timely financing of work, to consumers for the operation of the facility.

The main feature that distinguishes the developer from other participants in the real estate development process is creativity, pronounced entrepreneurial qualities that make him an independent factor which makes a personal contribution to increasing the value of the property [13, 14]. To a greater extent, the activity of a developer fits the definition of entrepreneurship formulated by J. Schumpeter, P. Drucker, and others, the essence of which is associated with innovation and creativity.

As a special type of professional activity, development includes full-fledged consulting in the broadest sense of the word and a real estate project management system, including the material creation of real estate objects.

The overall essence of development is the management of investment project in the field of real estate, which involves:

- Selection of cost-effective project;
- Identification and mitigation of risks associated with the project;
- Obtaining from the authorities the necessary permits for the implementation of the project;
- Determination of conditions for attracting investments, working out mechanisms and forms of their return;
- Search and attraction of investors;
- Selection of contractors, financing and control of their work;
- Sale of a real estate object or transfer to operation.

The main purpose of development is to generate income (profit) by creating objects (including improving the quality characteristics of land plots) that satisfy the needs of the purchasers of this property (buyers, tenants) to the maximum extent possible. However, in this case, it is not just about construction, but about a commercial project, which implies not only the creation of an object, but also making a profit from its use or sale.

Most of the current development companies are trying to remain at the same time the main contractors on the objects they create. Unfortunately, as a result, they often put the issues of construction organization in the foreground, leaving market problems in the background, forgetting that construction is not an end in itself [17, 18]. The goal is to generate income from the sale of the created object on the market, and this requires a study of demand, the choice of projects focused on a certain segment of consumers, an active policy to promote the project to the market, and much more. This comes from the wrong statement of the problem, instead of realizing the need to implement "what

we are building"; the question should be posed like this: "we need to build what can be sold" [21].

The experience of implementing land development projects shows that for large of them, it is advisable to create a specialized management company dealing exclusively with this project or several similar projects [12]. Attempts to implement a land development project within the framework of the main organizational structure of a development company, as a rule, give very inefficient results [49]. Thus, in order to manage a project for the integrated development of large land plots, it is necessary to create a separate legal entity responsible to the main developer organization for the results of the project.

It can be assumed that development is a direction in which other profitable lines of business transfer a significant part of their income, and the wide availability of borrowed funds, the development of the mechanism for their involvement in circulation and the variety of financial instruments create a favorable environment for the development and functioning of the development itself [28-31]. At the same time, development, like other types of entrepreneurial activity, depends on the investment climate in the region and on the culture of service in the country.

It should be noted that from the point of view of project management, the most preferable classification is the one that distinguishes the following types of projects:

- Terminal project (single project): it has an ultimate goal and limited content;
- Evolving project (a group of projects formed from an initiated one): it does not have a terminal, unambiguous goal, is limited in content, but not limited in time;
- Multi-project (a group of projects linked by resources): the presence of clear goals at the time of initiation of each project, unlimited content due to the many projects simultaneously implemented on an ongoing basis, unlimited in time;
- Program (a group of projects united by a common goal and conditions for implementation): the goal is limited in time, the content is limited, all projects in the program are interconnected;
- Open project (group of projects): it does not have an ultimate, terminal goal and is not limited in content;

Accordingly, each of the selected types of projects involves a special type of management:

- Management of terminal projects (strategic management, management by objectives);
- Developing project management (sliding management, project product configuration management);
- Multi-project management (strategic management, management of harmonization of goals and resources); program-target management (strategic management, project performance management);
- Management of open projects (sliding management, project content management).

Classifications of projects and types of their management make it possible to carry out decomposition, identify features, synthesize, and model the object of investment. As a result, the actions of the participants must be coordinated, resources must be optimized, the interests of the participants harmonized and the necessary quality ensured, which arises through the achievement of a synergistic effect of the complex of all management actions. This is the essence of project management.

It is known that each project has a life cycle, which is a model of its development in time, that determines the various situations in the process of its implementation. The project life cycle is a set of successive phases identified by project participants to control and manage the process of intensive transformation [22, 25]. The project life cycle model is a real project management tool that can be used to take into account the strategic aspects of the project and the organization as a whole, allocate resources,



manage risks. The project life cycle model should have both general properties that are characteristic of any type of project, and specific properties that are unique to this particular project. Such a combination of common typical characteristics and specific features is one of the basic principles of project management in development.

At the same time, there are fundamental differences in the life cycles of various types of projects, which is reflected in the functions and methods of managing them. So, the classical understanding of the life cycle as a period of time from the beginning to the end of the project is applicable to the terminal project [26]. In an evolving project, the project life cycle is combined with the product life cycle. The life cycle of an open project is open, the temporal structure of this cycle has a wave character, fundamentally unlimited in time, all the functions of managing such a project are based on a sliding principle. Multi-project management implies unlimited content and, therefore, has a constantly renewable life cycle.

Each project is an object of investment. Therefore, there is no need to single out a special group of investment projects. However, it is advisable to divide the life cycle of the project into three semantic phases: pre-investment, investment, and operational. Such a decomposition is convenient for making managerial decisions regarding project financing (allocation of resources).

The objective requirements of the territory development technology - development within territory planning - determine the discrepancy between the limited capabilities of developers and the scale of the tasks of developing cities and territories. The development of the territory is ensured by the construction "inside the territory" - on a land plot within the boundaries of a quarter, microdistrict, and "outside the territory" - this is the construction of "off-site" facilities and engineering networks. The possibilities of private developers are not enough to solve the problems of the development of the city as a whole [34-36]. Private developers master (develop) parts of the city - quarters, neighborhoods. The transition to the next level of the scale of activity - a district, a group of districts - means a transition to activities that private developers are usually unable to carry out, or they are not interested in this for objective reasons related to the laws of business.

This is the conflict between the limits of the economic possibilities of private developers and the development needs of the city as a whole that exceed them. However, this collision is resolvable with the application of certain technology.

Along with private developers, another entity should appear that is interested and ready to do what, as a rule, private developers do not do, namely, to build backbone networks and generating facilities of engineering and technical infrastructure. Public authorities can become such a subject. In the interaction of private developers and public authorities, the technology of partnership is born as a synchronization of the implementation of various (at least two) interrelated projects [38-42]. To solve this problem, a methodology for organizing a public-private partnership (PPP) is widely used.

At each stage of the life cycle of a construction object, traditional approaches are integrated with new technologies, approaches to work performance and project management are adjusted [27]. Given the specifics of the industry and the presence of a large number of regulatory factors, the digitalization of the construction and real estate sectors does not occur as quickly as in digital companies. Nevertheless, it should be recognized that digital technologies are becoming a new reality in the construction industry, and its future depends on how quickly the industry and its participants adapt to this new reality [10]. In particular, the latest information technologies can play a key role in the modern innovative development in construction. The functionality of Big Data will allow numerous subjects of an investment and construction project to analyze large amounts of various information in a short time, calculate

potential risks, model the process of making managerial decisions and predict their effectiveness.

Standardization of processes and effective application of information modeling technologies in the design of capital construction projects sets the vector of information modeling at subsequent stages of the life cycle of a real estate object, determines the success of investment and construction projects in general [44, 46-48]. From this, it follows that the issue of the quality of implementation of information modeling technologies in companies engaged in architectural and construction design of capital construction objects becomes decisive in the technological chain "design-construction-operation".

One of the key problems in 2D modeling is the loss of information. Moreover, the amount of lost information tends to accumulate from stage to stage of the object's life cycle. Linking information from different disciplines in the design, construction, and operation of a facility can be a complex process with non-obvious methods of solution. It requires the connection and systematization of existing information structures that use software from different manufacturers. Meanwhile, the systematization and elimination of barriers in the transfer of information is the key to improving the efficiency of managing a capital construction project.

The use of information modeling technologies is not just a fashionable trend - it is a real economic need, due to the necessity to ensure the efficient operation of the investment and construction industry.

Information modeling technologies are an innovative approach to the design-build-operate cycle. The development of an information model makes it possible to increase both the speed and economic efficiency of creating complex objects that do not violate the ecological balance [51-55]. Solutions based on information modeling technologies provide cost estimates, 4D visualization of construction processes, collision detection, information exchange with customers, as well as planning and optimization of construction processes, which leads to a reduction in material costs, increased productivity and cost savings at all stages of the capital construction object life cycle.

The main advantages of using information modeling technologies at the stage of architectural and construction design are the following:

- The ability to take into account the features of the existing infrastructure of adjacent territories when planning the location of capital construction facilities;
- The ability to take into account the features of the terrain and soil characteristics when designing engineering networks;
- The possibility of planning the transport network in the development area, taking into account changes in the transport situation of the adjacent territories;
- The ability to determine the optimal amount of resources required for the implementation of construction work;
- Determination of the optimal ways of delivery of materials, which allows minimizing the time and cost of deliveries.

In the process of functioning of the industry ecosystem, digital interaction is carried out as a digital form of organizing interactions between industry suppliers and consumers in order to minimize transaction costs (for example, when searching for partners, goods, services, arranging payments, concluding contracts, monitoring the implementation of agreements, etc., provided by a special platform) [23]. As part of the functioning of the digital ecosystem of the construction industry, the digital interaction of participants in investment construction projects should move to a new, digital level provided by the cloud information-design environment.

It is noteworthy that Big Data in construction includes not only data on the direct construction of facilities, but also on everything related to operation, energy supply, subsequent repairs and reconstruction, real estate services, etc. Taking into



account the share of spending on housing by individuals and commercial real estate by organizations, the costs associated directly or indirectly with construction show that among all Big Data, namely those in construction are the largest.

Evidently, various participants in the design, construction, and operation of the facility need different data to achieve the goals of their activities [56-59]. Taking into account the opacity of construction in general, the subjects of construction activity can interpret and distort them based in their own economic interests. Thus, appropriate solutions are needed.

In the general case, the basic process for generating data in construction is the process of designing a construction object. At present, the BIM-technology is being introduced into practice - its purpose is to give all graphic elements of the object model specific attributes with the aim of their subsequent use in the formation of estimates. BIM technology does not solve any other strategic tasks regarding the design process. All organizational relationships have been preserved since the days of drawing boards with drawings on paper. Thus, in fact, the development of CAD in construction over the past three decades is based on solving the problem of simplifying cost estimates in order to create various databases [60-62]. However, this technology creates a contradiction that does not allow generating data that can be classified as Big Data, and at the same time not solving any problems directly for the purposes of the design itself. The designer is paid for the development of sections of the construction project after the issuance of working documentation in a timely manner. BIM technology implies object modeling (which is not equivalent to the development of working documentation), that forces additional investments in software and personnel. At the same time, the use of BIM technology increases the time and cost of design. The financial result of the designer's activity is determined by the speed and quality of working documentation transferred to the construction, and not by the quality of modeling and preparation of databases. In other words, the designer is forced to invest additionally and carry out activities on the results of which other structures earn. This contradiction explains the reason for such a complex, long and largely unsuccessful introduction of BIM technologies into construction practice [23, 37, 49]. In different countries, overcoming this contradiction is carried out in various ways at the national level. All of them actually involve forcing the designer by administrative and economic methods to perform work that is useless for him.

If an attempt to introduce new technologies with appropriate applied tools into the practice of building design in various countries for decades has not everywhere led to the desired result, then there is a common fundamental reason. Construction is one of the most 'conservative' sectors of the economy, which was formed under the influence of a combination of limiting factors, in particular, the existence of building codes and the regulation of activities at the local and national level. Construction is a local industry, and it is not possible to import construction objects (such as engineering products) to increase competition, which leads to the formation of local engineering traditions and relationships that develop over generations [64-67]. It can also be assumed that the above factors lead to the situation when people who are employed in construction can be conditionally classified as traditionalists and conservatives. At a minimum, the professional growth of builders always occurs in the absence or insignificance of changes in the technological order. As a result of the influence of all factors, the construction industry is not very receptive to innovations. It is obvious that the existing BIM-technologies through the software presented on the market conceptually contradict the nature of relationships in construction, therefore, in order to obtain the appropriate Big Data, a fundamentally different approach is needed that would take into account industry specifics.

Combining Big Data with building information modeling (BIM) opens up other possibilities. Adding Big Data to 3D or 4D designs makes it easy for engineers to spot any error or make an accurate prediction. One of the advantages of BIM is the ability

to ensure collaboration of specialists from different countries on a model in real time. Using Big Data, they will be able to quickly transfer huge amounts of information to each other in order to make decisions faster. This fundamentally changes the approach to project management. Previously, all the data was owned by one person or several employees sitting in the same office. Today, true teamwork is possible, with the designer, developer, and general contractor, who may be located in different countries, together making changes to the project at an early stage. Thus, the development project becomes a truly aggregated system [45].

It is also noteworthy that Big Data can also contribute to a competent assessment of a construction project within the ecosystem of the territory, taking into account all social and economic implications - this is possible, in particular, based on aggregating data on the effects of gentrification, with the subsequent integration of AI and machine learning into the development of an appropriate construction project.

It should be noted that over the past 40-50 years, two trends have become established in the development of urban areas. They appeared to be especially relevant since the 1990s. First of all, it is about deindustrialization (the withdrawal of industrial facilities outside the city, followed by the reorientation of the vacated areas for the construction of residential and commercial real estate) and gentrification (increasing the value of real estate by transforming and regenerating the living environment around and inside buildings). Despite the ambiguity of the political assessments of the above processes, considered as the result of the development of neoliberalism within the framework of the post-industrial capitalist system, it is nevertheless possible to single out a stable content that determines the nature of the interaction of stakeholders in the process of making key decisions on the socio-economic development of the territory [45, 50, 63].

One of the consequences of the cities deindustrialization is a sharp reduction in jobs and the workers themselves, a depressed state of the economy, unemployment, and a drop in real investment. At the same time, while in large ("global") cities that have effectively adapted to the new conditions of economic development, it was possible to partially or completely compensate for the negative consequences of deindustrialization through trade, tourism, and financial services, in old industrial centers dependent on one industry (such as Lyon, Manchester, Sheffield, Essen, Detroit) or enterprises (single towns), the picture is not so 'rosy'.

Under these conditions, in the process of making economic decisions, it is necessary to take into account the totality of available and accessible resources at the city level, the most valuable of which are buildings and land. The process of gentrification of urban areas included the following stages.

*First stage.* In the early 1960s, a number of architects, with the support of the state and city authorities, developed projects related to the resettlement of areas characterized by a low standard of living and high crime in the absence of minimal amenities for residents [24]. It was, first of all, about the so-called ghettos (places of compact residence of racial and national minorities), depressive territories with an unfavorable economic and environmental situation in houses of mass settlement (factory dormitories or entire villages at industrial facilities). The consequence of these initiatives was the relocation of the inhabitants of the above-mentioned areas to more comfortable conditions, but with the simultaneous loss of pedestrian accessibility of the workplace and the growth of the outskirts and suburbs of large and medium-sized cities [32]. In parallel, there was an active redevelopment and restructuring of the central districts of the city, accompanied by an increase in the cost of housing and rent. As a result, some of the local residents were also forced to move to the periphery, however not for social, but for economic reasons, which, of course, could not but cause discontent on their part [32].

*The second stage* of increasing the value of real estate was the movement of “squatters” and “lofters” in the late 1970s. The essence of this phenomenon is the seizure or rent for a nominal fee of premises empty for one reason or another (apartments, houses, or entire neighborhoods) with the subsequent capitalization of cultural and social assets formed by their inhabitants. Indeed, due to the redevelopment of quarters, the massive outflow of residents (due to natural disasters, the economic crisis), the incompleteness of the process of primary gentrification described above, empty buildings and premises were quickly populated by the so-called “bohemian” - artists, creative youth, who, in addition to actually living organized workshops, art galleries, nightclubs, art supply stores, offices of small businesses. Subsequently, the places of “capture” formed their own “aura”, an image that promoted the growth of real estate prices in the surrounding neighborhoods. The fate of the seized premises in this case was twofold: either the displacement of the creative element through an increase in rental rates (up to forced eviction), or the institutionalization of spaces with giving them an official status. Such processes were actively taking place in Chicago, New York, Amsterdam, East Berlin, Paris, and, since the late 1980s, in the cities of the former USSR [43].

*Third stage.* Since the early 1980s, as a result of the deindustrialization of the urban economy described above, gentrification has also covered partially vacated industrial areas. Thus, enterprises rented out part of the space due to incomplete utilization of production capacities to small and medium-sized enterprises, and subsequently to non-core tenants. In some cases, production workshops were converted into residential premises and offices (for example, by dividing the space into several levels) while maintaining the production aesthetics, which became a separate direction in interior design (bare brickwork, elements of industrial equipment in the decor, metal structures with rivets, etc.). Despite the functional limitation and low transport accessibility of such premises, the cost of renting an office or a loft-style apartment in the area of the port or industrial development was 4-5 times higher than the average prices in the city [68]. Thus, the city authorities got the opportunity to mitigate and partially compensate for the consequences of the fall in the level of industrial development for the budget, considering, nevertheless, this process as a temporary and compromise measure.

*The fourth stage* was characterized by a change in the scale of this process of redevelopment of industrial zones since the late 1980s. Entire districts of the city with enterprises located on them fall under the demolition, rehabilitation, restructuring, or re-profiling of buildings. The main asset for the city authorities is the land under the factories and plants, the cost of which in the city center is very high. In some cases, it is possible to preserve buildings and structures, provided they meet the requirements of the developer or builder and the possibility of regenerating the surrounding space. In other words, if a former industrial building adds value to the area's new properties, it will be preserved. Otherwise, the destruction of the structure inevitably follows, often without regard to the historical and cultural value of the architectural structure. This phenomenon was actively supported by the authorities at the national and city levels within the framework of the “new industrial policy”, the essence of which was the withdrawal of enterprises from the city and the formation of modern high-tech industries within the framework of sectoral industrial clusters. At the same time, the presence of industrial facilities in the city center is considered as a factor constraining investment activity [43].

*The fifth stage* of gentrification in developed countries is associated with the reorientation, since the early 1990s, of entire industrial cities and regions as part of the strategy of internationalizing the economy and deepening the international division of labor, in which large industrial enterprises oriented to the local or regional market give way to network production systems, based on a flexible response to market needs, the cost of renting land and premises, and the availability of labor [15]. At the same time, the enterprise is able to quickly change the scale of its activities (from a set of small enterprises to large

industrial formations), location and tax residence. Thus, in conditions of mobility and variability (agility) of the production environment, the intangible component of the economy is becoming increasingly important for cities and regions. At the same time, the old industrial infrastructure becomes an integral part of the “image” of the territory, contributing to the formation of a “brand” to attract tourists, residents, labor, and entrepreneurs [11]. In other words, the effective development of the production specifics of the territory through the ‘mastering’ of the heritage of the industrial era can become the basis for the successful economic development of cities and regions in the context of globalization [19]. London, Sheffield, Rotterdam, Essen are often cited as successful examples of the implementation of a “brand” strategy at the city level – these are cities that have successfully applied the principles of converting the industrial past into an attractive image of the present and future for investors.

When considering modern gentrification, the cultural dimension of the described processes deserves special mention; in the name of these processes, the phrases “creative industries”, “creative clusters”, “rebirth through culture” (culture-led regeneration) are increasingly used, deriving from the general concept of “creative city” or “creative quarter”. This aspect of the phenomena under consideration prevails in urban development in modern conditions. A number of countries have established specialized departments at the national and city levels. An example is the UK, where the Department of environment, transport, and the regions operates, as well as a number of government initiatives to revive the former industrial cities that have fallen into decay (Urban task force) [15]. Another example is Spain, where “rebirth through culture” projects were implemented by appropriate institutions in Bilbao and Barcelona. Also, the USA should be mentioned (Portland, New Orleans) [16]. The unifying feature of cultural initiatives within the framework of gentrification is the desire to diversify the socio-cultural development of the territory and, in the framework of interaction with the owners of land and buildings, authorities, and local communities, to solve a number of systemic problems associated with the decline in the industrial potential of the territory.

Similar examples of “gentrification through culture” can be “found in many cities around the world, and such initiatives cannot but be recognized as effective, as they become centers of attraction for further development projects, creating a positive, well-recognized image of the place, which attracts investors and the right layer of potential clients” [19]. At the same time, the development of industrial zones in itself (even without a significant economic effect) can become an important component of the image of a city or territory. Most developers consider the development of creative clusters as an important element in the further promotion of the used site.

An important component of development in the United States are public initiatives in urban development and the cooperation of government authorities with companies operating in the real estate industry.

Moreover, let us look at some successful worldwide cases below.

Zurich, Switzerland. The multifunctional complex, located next to a major railway junction, not far from the city's main station, includes 5 buildings with offices, exhibition and concert halls, underground parking, restaurants and shops. Two buildings are five-story, two are seven-story, and the high-rise dominant is the 36-story Prime Tower building. It was built in 2011 by Swiss architects Annette Gigon and Mike Guyer Architekten. This is a business center with service rooms, bars and restaurants on the ground and top floors. Renting mainly comes from the upscale service sector. The environmental benefits of a building are made up of a number of factors. Firstly, the building is in the zone of large-scale renovation. Directly on the site, there used to be a mechanical plant for the production of gears. Secondly, several innovations were used in the building itself - in particular, the use of natural ventilation with the help of kinetic window systems that open parallel to the facade contributes to

energy saving. The process is controlled and monitored automatically. In addition to natural ventilation, the building also uses mechanical ventilation, which is built into the floor structure. Both of them are combined with a “chiller-fancoil” system, which uses heat pumps to heat the air in winter and cool it in summer. The building has repeatedly received awards for its high energy efficiency. The most valuable ones are the LEED gold certificate, the Green Property gold quality mark, as well as the certificate of the Minergie national system of “green” standards. To create a positive social climate, the designers proposed to improve the quality of the internal environment. The roofs of the stylobate part of the complex are landscaped, and the engineering and design solution of the atrium with a skylight made it possible to create spaces equal in terms of the amount of light for comfortable work. As for the economic side of the project, the profitability of the complex is justified by the rational use of the site, high building density as a result of choosing a high-rise solution and the development of underground space, an optimized composition of zones and premises in terms of the ratio of functions, as well as reducing the cost of electricity supply to a minimum.

Vienna, Austria. As a rule, along the railway tracks public and industrial buildings are erected, which is explained by sanitary and hygienic restrictions that do not allow the creation of residential buildings and recreational areas. However, in the dense buildings of European cities, exceptions to the rule are quite common. So, for example, it happened in the Donaustadt district of the Austrian capital. Being for a long time in isolation from the central districts of the city, this territory received a convenient and high-quality connection with them after the construction of an overpass line of modern high-speed rail transport. As a result, the area has become more attractive to citizens. Thus, the gentrification of the territory made it possible to achieve a good social effect: the area received a new impetus for development. In the wake of the increased interest of the population in living in this place in 2012, a 7-storey residential building was built here according to the project of the Artec Architekten workshop, the comfort of which allows people of different generations to live in it. It is located at a distance of only 8-12 m from the railway overpass, that is, almost right next to it. The proximity of this negative impact factor was taken into account by the designers, who were able to neutralize its impact with the help of a number of architectural, urban planning, and engineering design solutions. The main features of this apartment building, which reduce environmental risks, are the elongated shape, well-thought-out functional organization and the configuration of the northern facade made of perforated metal. The building is a noise barrier for the yard, and the sawtooth-shaped facade overlooking the railway makes it possible to illuminate the vertical winter garden, which runs to the entire height of the building, with diffused overhead light, and reduce noise from the railway in it, as well as in apartments. It should be noted that the facades of the building have improved thermal performance, which meet the standard of a “passive” house. In addition, the roof of the building has been landscaped, and each apartment has large balconies facing south. In cramped urban planning conditions, this partially compensates for the impossibility of creating a full-fledged landscaped public space in the local area. Photovoltaic panels installed on the roof help to reduce energy consumption and increase the economic efficiency of the building. Other engineering and design measures also serve the purposes of resource saving: a rainwater collection system for watering plants and a thermally active foundation used for space heating during the cold season.

Basel, Switzerland. In 2013-2018, a 22-storey multifunctional building Grosspeter Tower was built directly next to the railway tracks, separated from them only by a highway. The building is located within walking distance of the Bahnhof Basel SBB train station and includes offices, a conference room, and a hotel. During the design, construction, and operation of this facility by the architects of the Swiss bureau Burckhardt + Partner AG, various bio-positive technologies were provided to improve environmental friendliness. Most of them are related to the reduction of energy consumption. For example, the heating and

cooling of the building is provided by a system of geothermal probes. One of the unique innovations was the facade system, in which the share of glazing is minimized. Its design helps to reduce heat loss and achieve optimal light conditions in the premises. The photovoltaic film integrated into it turned the building into a real power plant. The air is heated by means of facade duct convectors, and its ventilation and cooling is carried out through the “ceiling sails”. The indoor air maintains a balance of carbon dioxide. There are bike paths in the surrounding area, which may encourage citizens to use an environmentally friendly form of transport - bicycles. These and other engineering and architectural decisions have become the reason for applying for a certificate under the LEED system. The social tasks solved in the project, first of all, concerned the creation of a comfortable environment in accordance with the principles of universal design. The entrances to the building are located on the same level with the ground level, there are no thresholds in the doorways, the dimensions of the elevator cabins, sanitary facilities and parking spaces are sufficient for use by people with disabilities. The compact floor plan and multi-level underground parking ensured sustainable use of urban land and improved energy efficiency during operation. Thanks to them, as well as due high-quality structures and equipment, it is possible to declare the cost-effectiveness of the building throughout the entire life cycle.

Portland, USA. The introduction of sustainable technologies has been characteristic of Portland for a long time. The main feature of the city policy in the design and construction of all municipal facilities is the obligatory adherence to the principles of sustainable development and the receipt by buildings of LEED certificates not lower than Gold. The low-rise office building “Columbia-Building” was built in 2013-2015 as part of a project to renovate a wastewater treatment plant built in 1952 in an industrial area of the city. The site is surrounded on three sides by railroad tracks, and on the fourth side - by a channel of the Columbia River. Here, the architects of the Skylab Architecture studio used an original approach. The space-planning solution of the building takes into account the surrounding landscape and the industrial history of the place. One of the important engineering and structural elements that contributes to the improvement of environmental conditions has become a water treatment system that allows discharging neutralized rainwater into the river from the roof of the building, as well as from the site, including from the surface of open car parks. Roofs also participate in this scheme as filters and flow regulators: they are landscaped with local floodplain and swampy plants. The economic effect is mainly associated with energy saving measures. The configuration of the building and the lighting system are adapted to the cardinal points and the movement of the sun. Ceiling light allows minimizing electricity consumption and improving the environment of indoor workspaces. In order to avoid overheating and to reduce noise from the nearby railway, the building was sunk into the embankment by more than 2 meters. Stainless steel facade blinds also protect against excess solar radiation. A heat recovery system and photovoltaic panels have reduced the consumption of energy supplied by the local thermal power plant. The problem of strengthening social efficiency was solved in an original way: the building is intended not only for the work of the engineering and technical staff of the station, but also for holding various cultural events. The interests of local authorities and environmental organizations interested in greening the city and popularizing sustainable development methods converged here. The opening of the industrial and utility-storage areas to the public made it possible to show the vital elements of the infrastructure. This became possible as a result of improving the safety of the site after the reorganization of the road network - the transfer of the highway and the placement of open public space in its place. On the territory of the facility, there are information and educational stands about the rich flora and fauna of the lake system of the Columbia River floodplain, about the environment, its evolution and methods of protection.

All these solutions and their implementation became possible thanks to the development of building projects as a composite

aggregated system, within the framework of contextualism as a paradigm which states that development and behavior are realized in some specific sum of external contexts - physical, historical and socio-cultural - and are determined by the interaction of factors of this total context.

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